



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE EVOLUTION OF THE TERTIARY MAMMALS, AND THE IMPORTANCE OF THEIR MIGRATIONS¹

PROFESSOR CHARLES DEPÉRET

UNIVERSITY OF LYONS

SECOND PAPER. OLIGOCENE EPOCH²

HAVING analyzed the *local evolution* and the *migrations* of the Eocene mammals (*Comptes rendus*, 6 novembre, 1905), I will now consider the corresponding data in regard to the Oligocene.

B. OLIGOCENE FAUNÆ.

I. Lower Oligocene (*Sannoisian* or *Lower Tongrian*).
Two successive faunæ:

(a) Fauna of the *white marl* of Pantin, Romainville. The fauna of the *lignites of Célas*, Avéjan, Vermeil (Gard), of the limestone of Brunstatt and of Rixheim (Alsace) are probably not very distant from this. Without doubt the same is also true of several deposits in the South West of France: Fronsac and la Grave (Gironde), Sainte-Sabine, Duras, Issigeac, Saint-Cernin (Dordogne). A part of the phosphorites of Quercy,³ and of the "terrain sidérolithique" of Fronstetten (Suabia) belong to the same level.

1. *Local Evolution*.—Continuance of the Palæotheriidae (Palæotherium, Plagiolophus), of the Anoplotheridae (last of Anoplotherium), of the Xiphodontidae (last Xiphodon), of the Rodentia—Theridomyidae (Theridomys).

¹ First paper, Eocene Epoch, in the February number of the NATURALIST.

² Extract from the *Comptes rendus des séances de l'Académie des Sciences*, t. CXLII, p. 618 (séance du 12 Mars, 1906). Translated by Johanna Kroeber.

³ The remarkable fauna of the phosphorites is not a homogeneous assemblage, but a composite representing horizons from the Bartonian to the Stampian, inclusive. In general, therefore, I shall consider only those genera of the phosphorites that have been found elsewhere in the stratified deposits, and whose age can thus be positively determined.

2. *No new migration* is known.

This fauna seems to be simply a much-reduced remnant of the Ludian fauna and should be more properly included with the upper Eocene.

(b) Fauna of the *limestone of Brie*, of Hempstead (Isle of Wight), of Ronzon (Velay), of Lobsann (Alsace), of Calaf and Tarrega (Catalonia). A part of the phosphorites of Quercy and of the "terrain sidérolithique" (Bohnerz) of Veringendorf, Veringenstadt, of the Eselsberg, of the Hochberg and of Oerlingerthal near Ulm, belong to the same horizon. Possibly the beds of Monte-Promina (Dalmatia) belong to this horizon or to the preceding one.

1. *Local Evolution*.—Continuance of the Palæotheriidae (Palæotherium, Plagiolophus), of Anthracotheriidae (continuance of Brachyodus, and appearance of species of Ancodus, some species of *Anthracotherium*), end of the Anoplotheriidae (last Diplobune), continuance of Cænotheriidae (Amphimeryx, ? Cænotherium), of Canidae (Cynodon, Cynodictis, Amphicynodon), of Erinaceidae (Tetracus), of Theridomyidae (Theridomys), of Hyænodontidae (Hyænodon), of the Marsupial Didelphyidae (Peratherium Amphiperatherium).

2. Important *North American migrations*: Sudden appearance of the Rhinocerotidae (Ronzotherium), and of the Entelodontidae (Entelodon).

3. Migrations of *unknown origin* of the Tragulidae (Gelocus), of Mustelidae (Proplesictis), of the Myomorph Rodentia (Cricetidae), and perhaps of the Amphicyoninae (beds of Tarrega).

II. Middle Oligocene (*Stampian* or *Upper Tongrian*), very numerous deposits: in the Paris basin, la Ferté-Aleps; in Germany, Ufhofen, Flonheim, Miesbach, lignites of Schluchtern, of Gusterneim and of Westerwald; in the basin of l'Allier, *Bournoncle-Saint-Pierre*, *Bons*, Perrier, Montaignut-le-Blanc, Champeix, Autrac, Saint-Germain-Lembron, Antoingt, Vodable, Solignat, Lamont-

gie, Nonette, *Orsonnette*, Malhat, Les Pradeaux, Les Chauffours, Bansat, Boudes, Chibrac, La Sauvetat, Jussat, Gergovia, Romagnat, Pérignat, Lemdes, Cournon, Marcain, Chaptuzat, Gannat, Saint-Menoux; in the basin of the Loire, Vaumas, Saint-Pourçain-sur-Bèbre, *Briennon*, Digoin; in the South East of France, Céreste, Manosque, clay of Saint-Henri near Marseilles, *les Milles* near Aix, Auzon near Alais; in the South West of France, Cestayrol, Saint-Sulpice, *Rabastens*, *hill of Saint-Martin*, *Montans*, *Salvagnac*, *l'Ile d'Albi*, *Pont-Sainte-Marie*, Tournon, Capellier, Les Péries, *Villebramar*, la Milloque, Comberatière, Moissac, Beauville, Itier, Bourg de Visa, Montségur, etc.; in Switzerland, Blauen, La Conversion, near Lausanne; in Italy, Cadibona in Liguria, Monteviale and Zovencedo in Vicenza; in Austria, Trifail in Styria, and deposits in Dalmatia; lignites of Inca (Island of Majorca); the larger part of the phosphorites.

It seems that from now on it will be possible to distinguish at least two horizons in this important stage: the lower (the principal deposits of which are given in italics in the preceding list), characterized by the persistence of the last representatives of *Palæotherium*, of *Entelodon*, or of *Gelocus*; the upper by the abundance of large-sized *Anthracotheerium* and *Acerotherium*, and the sudden appearance of the *Tapiridæ*.

For the stage as a whole, the facts in regard to evolution and migration are as follows:

1. *Local Evolution*. — Continuance of *Palæotheriidae* (*last appearance*), of *Rhinocerotidae* (*Aceratherium*, *Diceratherium*), of *Chalicotheriidae* (*Schizotherium*), of *Anthracotheriidae* (*Brachyodus*, *Anthracotheerium*, several phyla), of *Entelodontidae* (*last Entelodon*), of *Suidæ* (*Propalæochærus*, *Palæochærus*), of *Cænotheriidae* (*Cænotherium*, *Plesiomyx*), of *Tragulidae* (*last of Gelocus*, *Prodremotherium*, *Lophiomyx*), of *Theridomyidae* (*Theridomys*, *Issiodoromys*, *Archæomys*), of *Cricetinae* (*Cricetodon*), of *Talpidae* (*Geotrypus*), of *Erinaceidae* (*Erinaceus*), of *Chiroptera* (*Palæonycteris*), of *Creodonta* (*last*

Hyænodon and last Pterodon, Dasyurodon), of Canidæ (Amphicyon), of Mustelidæ (Plesictis, Palæogale), of Viverridæ (Amphictis), of Marsupialia (Peratherium).

2. Migrations of *North American origin* of Tapiridæ (Protapirus, Paratapirus), and of Amynodontidæ (Cadurotherium⁴), and perhaps of the Felidæ-Machærodinæ (Eusmilus).

3. Migration *probably from Africa* (and perhaps a little before the Stampian), of Edentata with normal vertebræ (Leptomanis and Archæorycteropus of the phosphorite beds).⁵

4. Migrations of *unknown origin* of Cervulinæ (Dremotherium, Amphitragulus), of Castoridæ (Steneofiber), of Myogalidæ (Echinogale, Myogale), of Tupaiidæ (Plesiosorex), of Soricidæ (Amphisorex, Sorex), of Lutrinnæ (Potamotherium), of the Felidæ-Proælurinæ (Pseudælorus), and of Lagomorph Rodentia (Lagomyidæ, genus Titanomys).

III. Upper Oligocene (*Aquitanian*).

Principal deposits: in the Paris basin, Celles-sur-Cher; in the Bourbonnais, Saint-Gérard-le-Puy, Chaveroche; in Germany, Weissenau and Mombach near Mainz, Haslach, Eckingen near Ulm; in Switzerland the Gray Molasse of Lausanne, Othmarsingen, Hohe Rhonen; in Savoy, Pyrimont-Challonges; in Provence, Varages (Var); Boujac in the basin of Alais; in Catalonia, Rubi near Barcelona; in Bohemia, Tuchoritz; in Karinthia, Keutschach; in Hungary, Waitzen.

1. *Local Evolution*.—Continuance of Tapiridæ (Paratapirus), of Rhinocerotidæ (Aceratherium, Dicerathe-

⁴ M. Boule (*Comptes rendus*, 18 mai, 1896) has endeavored to prove an affiliation between Cadurotherium and certain Ungulata of Patagonia, such as Astrapotherium; this relationship would be interesting, if demonstrated, for it would imply a *Patagonian migration* in the Oligocene period. But the supposed affinity rests, in my opinion, upon rather superficial resemblances of the dental system.

⁵ I do not believe in the existence of South American Edentata in the Oligocene of the phosphorite beds. The *Necrodasyptus* of Filhol seems to me to be a dermal plate of a Reptile related to *Placosaurus* Gervais.

rium), of Chalicotheriidae (Macrotherium), of Anthracotheriidae (Brachyodus, last of Anthracotherium), of Suidae (Palaeochærus, ? Doliochærus), of Cænotheriidae (Cænotherium, Plesiomeryx), of Cervulinae (last Dremotherium and Amphitragulus), of Theridomyidae (Theridomys), of Myoxidae (Myoxus), of Eomyidae (Rhodanomys), of Sciuridae (Sciurus), of Castoridae (Steneofiber), of Lagomorph Rodentia (Titanomys), of Talpidae (Talpa), of Soricidae (Sorex), of Erinaceidae (Palæoerinaceus, Erinaceus), of Canidae (Amphicynodon, Cephalogale), of Amphicyoninae (Amphicyon), of Mustelidae (Stenogale, Plesictis, Palæogale), of Lutrinae (Potamotherium), of Viverridae (Amphictis, Herpestes), of Felidae (Proælorus), of Marsupialia (the last European Didelphyidae).

2. Smaller migrations of *unknown origin* of the Dimylidae (Dimylus, Cordylodon).

The Aquitanian fauna is chiefly an impoverished residue of the Stampian.

Important migrations begin again with the Miocene epoch, and these will form the subject of a later paper.